Tag shedding estimation in *Palinurus elephas* (Fabricius, 1787)

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Knowing tag-shedding probability is important

Capture-Mark-Recapture methods rely on **identifying tags and their traceability** with time, allowing the estimation of population parameters such as abundance, survival, growth and movement.

Due to ageing, wear and tear or molting, **tags may become detached**, leading to biased parameter estimates.

Studies on the benefits of marine protected areas for the **spiny lobster *Palinurus elephas*** (population size, emigration, spillover) are based on tag-recapture data (Goñi et al. 2006, Goñi et al. 2010).

Double tagging experiments to estimate tag-shedding

Three tagging surveys (2000-2002) and nine (2001-2009) recapture surveys carried out in June in the Columbretes MPA and surrounding fishing grounds.

Lobsters were double-tagged with Hallprint® T-bar anchor tags.

Figure 1

Double tagging *P. elephas*: Conspicuous tags were inserted dorso-laterally on both sides between the 1st and 2nd abdominal segments. The detection and reporting probabilities from fishermen involved in the tag recovery program are similar to those obtained by scientific staff during the experimental surveys.

Double-tagged

Tag survey	Female	Male
2000	297	240
2001	583	293
2002	460	150
	1340	683
	2023	

Recaptured double or single

	Female		Male	
Tag survey	Double	Single	Double	Single
2000	105	24	105	21
2001	180	54	114	33
2002	114	40	52	25
	399	118	271	79
	517		350	

Double tagged : 2023

Total recaptured (2001-2009): 867 ; Single–tag: 197 (23%)

Tag-shedding estimation

Tag-shedding rate estimated by weighted linear regression (Chapman et al., 1965) of the log-transformed percentage of tags lost with time.

Number of re-encountered animals (N_{double} + N_{single}) at every particular instant ***t*** used as weights (Equation 1).

Equation 1

ρ : Immediate tag loss (Type I loss)

L *: Instantaneous rate of tag loss in the long term (Type II loss)*

$$\hat{P} = 1 - \rho\, e^{-\hat{L}\, t}$$

$$1 - \rho = \text{immediate tag loss}$$

$$\hat{L} = \text{instantaneous rate of tag loss}$$

References

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For further information

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More information on this and related projects can be obtained at

http://www.ba.ieo.es/en/investigacion/grupos-de-investigacion/RESMARE

Instantaneous rate of tag loss (L) and the resulting probability of tag loss (PTL) after the first year at liberty.

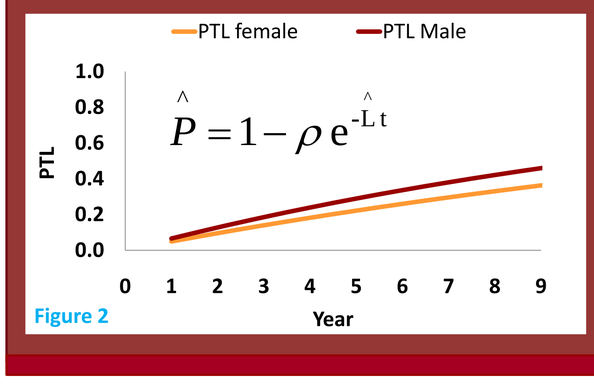

Figure 2

		Estimate		SE	p-value
L	Female	0.0042	±	0.0004	***
L	Male	0.0057	±	0.0005	***
PTL 1st year	Female	0.0488	±	0.0048	
PTL 1st year	Male	0.0661	±	0.0064	

Using PTL estimates, the probabilities of keeping two, one or no tags were computed.

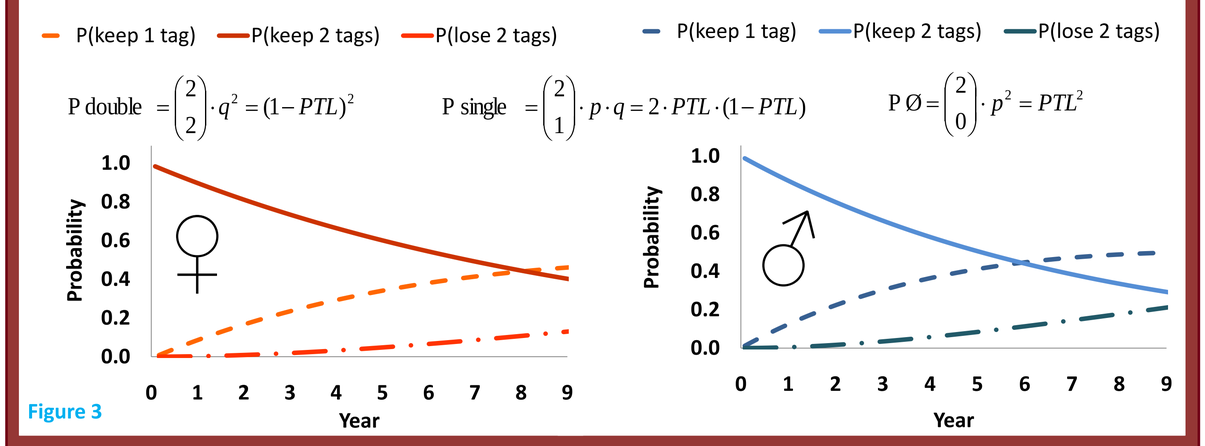

Figure 3

Observed pattern of lobsters encountered with a single tag and the expected proportion of single-tag lobsters.

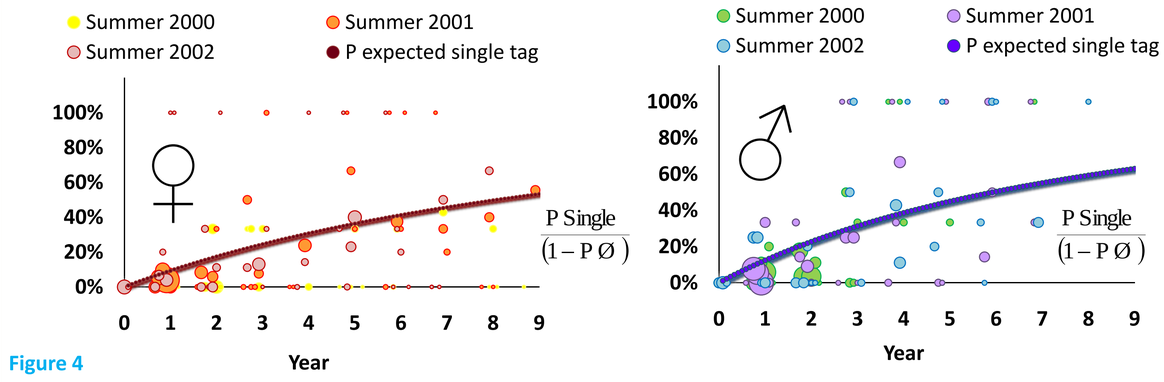

Figure 4

RESULTS: Immediate & long-term tag-loss

Immediate tag loss: **Negligible**

Long-term tag loss: **6% /year** (sexes combined) **after the 1st year at liberty** (Figure 2)

This probability was back-transformed (Figure 3) and compared with observed data showing a good fit (Figure 4).

IMPLICATIONS

1. Immediate tag loss is negligible.
2. Long-term tag loss is lower than reported in studies of other species in a variety of conditions (Gonzalez-Vicente et al. 2009) and similar to *Jasus edwardsii* (Frusher et al. 2008).
3. Males have higher odds to lose tags than females due to their greater molt frequency.
4. Results forecast a high long-term retention, indicating that T-bar anchor tags as well as the insertion method are suitable for the study of *P. elephas* populations in the wild.
5. These estimates will enable us to correct population parameters obtained with Capture-Mark-Recapture data.

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